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P2.2001 Determination of 100 TW femtosecond laser contrast from measurements of specular reflectivity from solid target

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Temporal contrast is a crucial parameter for high-power short-pulse laser facilities. At insufficient contrast, amplified spontaneous emission (ASE) prepulse - which is inherent to lasers based on chirped-pulse amplification scheme - can create plasma on surface of a solid target before arrival of the main pulse. This preplasma reduces coupling of the main laser pulse energy to dense target layers. Contrast influences laser-driven ion acceleration [1], Kα radiation source properties [2], higher order harmonics generation [3]. Precise determination of contrast is a challenging task. It requires measurements with dynamic range higher than 10^{10} in time interval of ~10 ns with resolution of the order of the main pulse duration. A simple method for estimation of ASE prepulse energy was proposed in [4]. It is based on measuring brightness of specularly reflected from a solid target laser radiation on a scattering screen. Using this method, we investigated ASE contrast of 100 TW femtosecond laser facility before and after insertion of RG-850 saturable absorber into amplification chain. ASE intensity was also measured over delay times from -400 ps to 0 ps by a 3rd order crosscorrelator. Analysis of the images from scattering screen has shown that, in addition to ASE prepulse, contrast is affected by change of laser light absorption mechanisms at intensities $10^{16}...10^{17}$ W/cm^2. This factor limits applicability of the method [4].

References
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